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M. de Mainof, secretary of the ethnographical section of the Russian Geographical Society, has announced to the society that he is preparing a complete treatise on Russian Ethnography. It will appear in parts, each containing a description of one section of the people.

The April number of *Matériaux* contains a review of Italian prehistoric bibliography, for 1875; Studies on the Megalithic Monuments of the Valley of the Ouse; Superposition of the Solutréan upon the Moustieran at Thorigne (Mayenne); The Lacustrine Tombs of Auvernier, and an illustrated article by A. L. Lewis, upon the construction of Megalithic Monuments in India. Those who have sought for a rational theory of the manner in which such masses of stone were erected by uncivilized peoples in Europe, will find a plausible explanation here.

The Rhind Lectureship in Archæology, in connection with the Society of Antiquaries of Scotland, founded by a bequest of the late Alexander Henry Rhind, of Sibster, was filled during the last season by Dr. Arthur Mitchell, joint secretary of the society, upon the question, "Do we possess the means of determining scientifically the condition of primeval man and his age upon the earth?" In consequence of a great many coexistences of high and low culture in the same locality, and the immense changes known to have been wrought within the space of even a century, the author comes to the following conclusions:—

(1.) That the very rudest known form of any art may coexist in a nation with the highest.

(2.) That it would be wrong to conclude from this that the nation must be composed part of civilized and part of savage people.

(3.) That persons capable of receiving the highest culture might practice an art which belonged to the most palæolithic people. — O. T. MASON.

GEOLOGY AND PALÆONTOLOGY.

RECENT DISCOVERIES OF EXTINCT ANIMALS BY PROFESSOR MARSH. — In a lecture to the graduating class of Yale College, delivered in the new Peabody Museum, June 3d, Professor O. C. Marsh gave a brief *résumé* of the more important results of his late palæontological researches in the Rocky Mountain region. His explorations, which were attended with much hardship and danger, have been mainly confined to the Cretaceous and Tertiary formations, and especially to the vertebrate fauna. During the past six years, the expeditions under his charge have brought to light more than three hundred species of fossil vertebrates new to science, about two hundred of which he has already described.

Among the extinct animals thus discovered, were many new groups, representing forms of life hitherto unknown. The most interesting of these are the Cretaceous *Odontornithes*, or birds with teeth, which constitute a new sub-class, containing two distinct orders, namely, the *Odontolææ*, which have the teeth in grooves, and the *Odontotormæ*, with teeth in distinct sockets. The former were swimming birds of gigantic size, with

rudimentary wings, and the vertebræ as in modern birds. The type genus is *Hesperornis*, and three species are known. The second order embraces at present only small birds with powerful wings, and biconcave vertebræ. The type genus is *Ichthyornis*, and the geological horizon is upper Cretaceous. Another discovery of importance from the same formation was pterodactyls, or flying reptiles, the first detected in this country. These are of much interest, on account of their enormous size, — some having a spread of wings of more than twenty-five feet, — but especially as they were destitute of teeth, and hence resemble recent birds. They form a new order *Pteranodontia*, from the typical genus *Pteranodon*, six species of which are now known. With these fossils were found large numbers of Mosasauroid reptiles, and remains of more than five hundred different individuals were collected. These proved to belong to two new families, *Tylosauridæ* and *Edestosauridæ*. Some of the former attained a length of sixty feet, while the latter were much shorter, the smallest being less than ten feet. These groups included several new genera and many species. This large series of specimens enabled Professor Marsh to clear up many doubtful points in the structure of these reptiles, and to determine that they possessed hind paddles, and were covered, in part at least, with bony dermal scutes. Many other birds, reptiles, and fishes were found in the same Cretaceous strata.

The discoveries of Professor Marsh and party in the Tertiary of the West were of no less importance. The most interesting are those made in the two Eocene lake-basins between the Rocky Mountains and the Wahsatch Range. These basins were explored by Professor Marsh in 1870, and their Eocene age then first determined. His explorations in this region have secured to science over one hundred and fifty species of new vertebrates, most of them widely different from any hitherto known. The most remarkable of these are the gigantic mammals of the new order *Dinocerata*, the type genus of which is *Dinoceras*. These animals nearly equaled the elephant in size, but the limbs were shorter. The skull was armed with two or more pairs of horn-cores, and with enormous canine tusks, similar to those of the walrus. The brain was proportionally smaller than in any other land mammal. Three genera and several species are known. Remains of more than one hundred distinct individuals were obtained, and are now in the Yale Museum. The *Tillodontia* are another new order of mammals discovered in the same Eocene deposits. They possess many remarkable characters, which indicate affinities with the Carnivores, Rodents, and Ungulates. There are two well-marked families, the *Tillotheridæ*, from the typical genus *Tillotherium*, which has rodent-like incisors; and the *Stylinodontidæ*, in which all the teeth grew from persistent pulps. The largest of these peculiar animals was about the size of a tapir. One of the most interesting discoveries made by Professor Marsh in the Eocene of Wyoming was the remains of *Quadrumania*, the first found in the strata of America.

These early Primates appear to be related both to the lemurs of the Old World, and to some of the South American monkeys. Two families are known, the *Lemuravidae*, from *Lemuravus*, the principal genus, which has forty-four teeth, and the *Limnotheridae*, which have not more than forty. The latter group is rich in genera and species. Among the other Eocene mammals discovered were marsupials and bats, not before known in a fossil state in this country. One of the most important Eocene mammals found was a small ungulate, which is the oldest probable ancestor of the horse. It was about as large as a fox, and had four toes before and three behind. The genus was named *Orohippus*, and several species were discovered. These remains, in connection with others from the later tertiary, enabled Professor Marsh to trace the line of descent which has apparently produced the modern horse. In addition to the Eocene mammals, many species of birds, serpents, lizards, and other vertebrates were collected.

The discoveries made by the same expeditions in the Miocene and Pliocene lake-basins of the Rocky Mountains and Pacific coast were likewise very numerous, and many new forms of animal life were brought to light. One group of mammals found in the early Miocene of Oregon is allied to the modern *Rhinoceros*, but differs in having a transverse pair of horn-cores on the nasal bones. The genus was called *Diceratherium*, and one of its species is the oldest known member of the Rhinoceros family, if not its progenitor. The most remarkable mammals found in the Miocene were the huge *Brontotheridae*, which are apparently allied both to the above group and to the Eocene *Dinocerata*. They equaled the latter in size, and also had an elevated pair of horn-cores on the maxillary bones. One genus of this family was previously known by a few imperfect specimens. Besides *Brontotherium*, several other new genera of this group were found, represented by portions of over two hundred individuals. With these remains was discovered a genus of small equines, *Mesohippus*, about as large as a sheep, and having three toes on each foot, with an additional "splint" bone on those in front, thus forming an interesting Miocene link in the genealogy of the horse, completed by the Pliocene genera. Over thirty species of fossil horses were collected in these formations. Among the interesting animals obtained in the Pliocene deposits were two species of large Edentates, the first tertiary representatives of this order from America. They belong to a new genus, *Morotherium*. There were also found large numbers of rhinoceroses, camels, Suillines, and other mammals, as well as many birds, reptiles, and fishes.

A study of the large series of extinct animals thus collected, and now in the Yale Museum, promises to throw much light on the development of life on this continent, and Professor Marsh has already drawn from them some important principles. One of these relates to the size and growth of the brain in mammals, from the beginning of the Tertiary to

the present time. The conclusions reached may be briefly stated as follows: *First*, all tertiary mammals had small brains; *second*, there was a gradual increase in the size of the brain during this period; *third*, this increase was mainly confined to the cerebral hemispheres, or higher portion of the brain; *fourth*, in some groups, the convolutions of the brain have gradually become more complicated; *fifth*, in some, the cerebellum and olfactory lobes have even diminished in size. There is some evidence that the same general law of brain-growth holds good for birds and reptiles from the Cretaceous to the present time.

Some additional conclusions in regard to American Tertiary mammals, so far as now known, are as follows: *First*, all the *Ungulata* from the Eocene and Miocene had upper and lower incisors; *second*, all Eocene and Miocene mammals had separate scaphoid and lunar bones; *third*, all mammals from these formations had separate metapodial bones.

In conclusion, Professor Marsh stated that his work in the field was now essentially completed, and that all the fossil remains collected, and in part described, were now in the Yale College Museum. In future, he should devote himself to their study and full description; and hoped at no distant day to make public the complete results.

EXTINCT CORAL REEF AT BAHIA. — The Geological Commission of Brazil has just been examining with a great deal of interest, in the Bay of Bahia, an extinct reef, which would need little more than an intermingling with geological strata to make it resemble some of the limestone formations of the United States. Opposite the city of Bahia is the large and long island of Itaparica, which extends in nearly a north-east and southwest direction. It is formed of *cretaceous* rocks which appear along a large portion of the shore, and, outcropping underneath the water, afford good foundations for coral growth. The reef we have just mentioned is a fringing one, extending along the middle part of the southeast side of the island, for a distance of about eight nautical miles, and distant from the shore from one eighth to one quarter of a mile. It apparently follows a line of outcrop of *cretaceous* sandstone, and is made up mainly of a few species of corals and of nullipores, the latter form seeming to contribute the greatest amount of material to the reef. Running along the reef, we find that it varies in width from sixty to nearly two hundred feet; at extreme low tide its height above the water is about four and one half feet, and this height does not vary much throughout its entire length. At high water the reef is covered by the sea, which almost constantly breaks upon it, and, as the entire reef faces the ocean, in times of storm a heavy line of breakers is formed outside of the shore. Then, even at low tide, the sea often breaks entirely over the reef and makes an examination dangerous. There are numerous openings, or *barras*, through which small boats can enter and find a safe harbor within. At the southern end it becomes broken up and lies in detached portions. The reef has sometimes a single elevation above

low water, at other times two ; where there is one, it is broad and quite level, with only slight irregularities, often broken into by pools and short channels ; where there are two, the lower, which has a varying height, is broad, resembling the above, and near the outer edge it rises into a narrow upper level, very irregular and generally covered with barnacles. These two series graduate into one another. The outer edge of the reef, after rather a rapid descent from the higher levels, descends gradually under the water, but the sea has been so rough the past month as to prevent an examination far down. The inner edge is quite abrupt, descending thus to the bottom, and generally has numerous outliers. The total height of the reef above the bottom inside, is only about seven to ten feet, and often very much less from an accumulation of material there. In breaking into the upper part we always find a simple nullipore growth, layer upon layer, and so compact and hard as to often break the edge of the chisel broadly off in vain endeavors. In the lower levels we find huge heads of *Acanthastræa Braziliensis*, and more rarely *Heliastræa aperta*. *Siderastræa stellata* is abundant, and generally of large size. We also find some immense growths of *Millepora*, but even here the *Nulliporas* are the most common. The outer coating of the reef is of a brown color and all looks alike from the dead encrusting nullipores. What is the life of the reef? Only a few boring animals, now and then a specimen of *Symphyllia Hartii*, *Siderastræa stellata*, or a small *Favia* in the tide or open pools. Sea-weeds are very abundant, and there is generally a rich nullipore growth on the outer edge of the reef, for a short distance above low-tide level. We know from the raised beaches, that the shores around the bay have all been elevated at rather a late period, and the reef was undoubtedly raised at the same time. Thus the destruction of the life. It would seem as though the reef had been a coral one, but coming into the action of the waves, only nullipores could grow, and not a single coral exists in the upper portion. The bottom inside of the reef has a thick bed of fragments of the same corals we mentioned above, and in addition immense numbers of the fragments of *Mussa Hartii*, which has not yet been found alive in the bay of Bahia. This deposit is more or less consolidated, and the material composing it must have been broken from the reef during the period of its elevation. Then probably all the more fragile portions were swept inward by the waves to form this broad layer, which consists most largely of *Millepora* and *Nullipora*. The former must have been dead ere it was broken off, as the specimens are generally covered over above with a coating of *Nullipora*. — R. RATHBUN.